

# WHAT IS CLAIMED IS

(Code Division Multiple Access)

1. A spreading method for use in a CDMA multi-rate system, comprising the steps of:

(A) coding message codes using Gray codes;

(B) generating a generating matrix,  $G_i$ , based on formed Gray codes;

and

(C) multiplying the message coded by the Gray codes with the generating matrix for generating an OVSF codes with a specific length.

2. The spreading method for use in a CDMA multi-rate system as claimed in claim 1, wherein said message is coded by a digital logic assembly circuit.

3. The spreading method for use in a CDMA multi-rate system as claimed in claim 2, wherein said digital logic assembly circuit is an encoder with a plurality of coefficients, and these coefficients are generated through the following matrix:

$$G_i = \begin{bmatrix} C_{2^i}^{(1,0,\dots,0)}(j_{i-1}) \\ C_{2^i}^{(0,1,0,\dots,0)}(j_{i-2}) \\ \vdots \\ C_{2^i}^{(0,\dots,0,1)}(j_0) \end{bmatrix}$$

4. The spreading method for use in a CDMA multi-rate system as

claimed in claim 1, further comprising the step of employing a multiplying circuit and said Gray codes are used as inputs of the encoder.

5. The spreading method for use in a CDMA multi-rate system as claimed in claim 1, wherein if extra Gray code label inputs are connected to "0" and extra output bits are discarded, a single encoding circuit is used to generate a short-length OVFSF code in the code tree, thereby generating a whole OVFSF code tree by storing a  $G_n$ , wherein n is the largest i.

6. A method for determining a mother code and a children code in a CDMA multi-rate system, comprising the steps of:

(A) using a plurality of Gray codes as labels of a plurality of OVFSF codes; and

(B) determining whether a first OVFSF code and a second OVFSF code have a relation of a mother code and a children code by determining whether a label of said first OVFSF code is a prefix of a label of said second OVFSF code.

7. The method for determining a mother code and a children code in a CDMA multi-rate system as claimed in claim 6, wherein each OVFSF code has a specific Gray code label, and wherein if an OVFSF code is 0011, then a respective Gray code label is 01.

8. The method for determining a mother code or a children code in a CDMA multi-rate system as claimed in claim 6, wherein said Gray code labels serve to determine whether two OVFSF codes have a relation of a mother code to a children code, assuming that said first

OVSF code of 0011 has a Gray code label of 01, and said second OVSF code of 00111100 has a Gray code label of 010, and then said first OVSF code of 0011 is a mother code of said second OVSF code of 00111100.

(Orthogonal Variable Spreading Factor Code Division Multiple Access)

9. A method for exchanging OVSF codes in a CDMA multi-rate system, comprising the steps of:

(A) using a plurality of Gray codes as labels of a plurality of OVSF codes;

(B) performing a modulo-2 operation on the Gray code label of a first OVSF code and the Gray code label of a second OVSF code for generating a label of a third OVSF code; and

(C) performing a modulo-2 operation on said third OVSF code and said first OVSF code for generating said second OVSF code.

10. The method for exchanging OVSF codes in a CDMA multi-rate system as claimed in claim 9, wherein each of said OVSF codes has a specific Gray code label.

11. The method for exchanging OVSF codes in a CDMA multi-rate system as claimed in claim 9, furthering comprising the step of employing a modulo-2 adder to generate said OVSF codes.